

REMARKS

Claims 1, 11, 13, 14, 16-18, 29, and 31-34 are amended. New claims 35 and 36 are added. Amendments and new claims are supported in the application generally, but at least at paragraph 54 and Fig. 4. Claims 7, 8, and 12 were previously cancelled without prejudice. Claims 1-6, 9-11, and 13-36 are pending – no new matter has been added. All arguments set forth herein are made without prejudice. A request for continued examination and fees for the necessary extension of time to respond are submitted herewith.

Claims 1-3, 5-6, 13, 14, 16-18, 25, and 27-34 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,193,340 (“Kamihara”) in view of U.S. Patent 5,412,946 (“Oshima”) and U.S. Patent 7,000,384 (“Kagenishi”). Applicants respectfully traverse this rejection.

Claim 1 defines a method of controlling an exhaust filter regeneration regime and recites “injecting fuel into an exhaust stream and thereby increasing an exhaust stream temperature, said increasing exhaust stream temperature being in conjunction with a catalytic treatment element; metering the fuel injection dependent upon the exhaust stream temperature; pre-heating the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” This method is patentable over the Kamihara-Oshima-Kagenishi combination.

The primary reference, Kamihara, is acknowledged by the Office Action (at 2) as failing to teach or suggest preheating fuel to be injected into an exhaust stream with vehicle waste heat, which is a feature of the method of claim 1. The Office Action cites (at 2-3) Oshima as disclosing the preheating fuel with waste heat feature of the claim, specifically identifying Fig. 1 (reproduced below) of the reference for this disclosure.

The schematic diagram illustrates a hydrogen supply system for a vehicle engine. A FUEL TANK (105) provides fuel to a FUEL INJECTION VALVE (106), which is controlled by a CONTROLLER (7). The fuel is injected into the intake manifold (103) of an internal combustion engine (100). The engine's output passes through an EXHAUST MANIFOLD (102) and a MUFFLER (3) before entering an NOx RED. CAT. (2). A hydrogen supply system is also shown, consisting of a HYDROGEN STORAGE DEVICE (104) and a HYDROGEN SUPPLY VALVE (108). The hydrogen supply system is controlled by the CONTROLLER (7). The hydrogen supply valve (108) is connected to the intake manifold (103) via a line (109). The hydrogen supply system also includes a pressure sensor (5) and a flow sensor (6). The hydrogen supply system is connected to the engine's intake manifold (103) via a line (101) and a check valve (110). The hydrogen supply system is also connected to the engine's exhaust manifold (102) via a line (111).

Furthermore, the Oshima reforming catalytic converter / hydrogen generator (102) converts supplied fuel into H₂ - reduction agent - for use with a NO_x reduction catalyst (2) further downstream along the exhaust (101). Thus, at best, in Oshima it is H₂ that is injected into the exhaust conduit (101), not fuel and not preheated fuel, per the claims. Oshima discloses at column 4, a number of chemical reactions that take place within the reduction catalyst, depending on the

fuel type used, thus, in addition to not being pre-heated and not being pre-heated with waste heat, fuel is not even injected into the exhaust conduit in Oshima.

Even if Oshima did teach injecting fuel into an exhaust stream, or preheating fuel for such a purpose, or using waste engine heat other than from an exhaust stream to do this preheating, none of which it does, there would have been no motivation to have combined Oshima with Kamihara and Kagenishi for such purposes. The rationale for such combination argued in the Office Action that “use of the waste heat of the exhaust gas to heat fuel before injecting into the exhaust gas [would improve] the efficiency of the filter regeneration,” however, is not necessarily correct. The idea that fuel must or should be heated before injection into an exhaust system for enhanced exhaust filtration is not suggested anywhere in the references, nor is this indicated in the Office Action to be a well known feature or desire in the art. As discussed above, neither the references themselves nor the common knowledge in the relevant field suggests that fuel should be heated before being introduced into an exhaust conduit. The Office Action provides no possible source, other than the present application, for such a concept and this would constitute the improper use of hindsight reasoning.

Oshima is not concerned with regenerating an exhaust filter, which is the focus of Kamhara, but rather with reducing NO_x in the exhaust gas. The only mention of a filter in Oshima is a very brief comment at column 6, lines 42-44 stating, “a soot trapper...may be provided upstream of the NO_x reduction catalyst.” This does not amount to a suggestion for combination. Even if Oshima were considered by one of ordinary skill in the art for combining with Kamihara and/or Kagenishi, the Office Action does not explain how or why the resulting juxtaposition of features resulting from such a combination would provide anything approaching a technically sound system. The skilled person would quickly dismiss such a combination for several reasons, as follows.

If anything, the references actually teach away from their combination as their purposes are too divergent. In column 10, lines 60-65, Oshima discloses that NO_x conversion is improved if no soot is formed on the NO_x reduction catalyst. This is in direct conflict with the system of

Kamihara, which is designed to deal with and rectify particulate build-up (e.g., soot and the like) on a trap filter. The system of Oshima is therefore unsuitable for combination with Kamihara. Furthermore, even if, in a bid to avoid soot build-up, it were considered to add the NO_x reducing filter of Oshima downstream of the trap filter of Kamihara, the H₂ that would be injected upstream from the trap filter (this is where Kamihara positions its injection valve 5) would be oxidized when passing through the oxidation catalyst of the trap filter of Kamihara (see column 3, lines 23-29 of Kamihara). Consequently, the aim of Oshima, which is to reduce NO_x in the exhaust gas would be destroyed as there would be no H₂ to promote the desired reaction and Kamihara would not receive any benefit from the Oshima system.

If the skilled person was motivated to simply bolt on the Oshima system downstream from the trap filter of Kamihara (e.g., motivated to “try”), this would also not result in the claimed invention. The resulting system would comprise a trap filter with fuel injected upstream in order to promote combustion of particulates in the trap filter, followed by a NO_x reducing catalyst downstream of the trap filter that operates by way of injected H₂. At no point in such a system would fuel be pre-heated with vehicle waste heat, with that pre-heated fuel then being injected into the exhaust stream to increase the exhaust stream temperature.

Also, Oshima specifically discloses at column 5, lines 42-47 that the NO_x reduction catalyst should be disposed *away* from a high temperature position in order to prevent an undesired reaction of H₂ and O₂ rather than the desired H₂ and NO_x reaction. This explicitly discloses that Oshima does not aim to increase the exhaust gas temperature, which is in direct conflict with Kamihara. For this reason alone, Oshima would not be combined with Kamihara.

The two very different systems of Kamihara and Oshima require the measuring of different parameters and aim to provide different effects within an exhaust system. Accordingly, the two documents would not have been combined by one of ordinary skill in the art.

Turning to Kagenishi, this document discloses the desire to combust both O₂ and NO₂ with filter 18 (see for example column 6, lines 61-62) which would produce an exothermic reaction.

Additionally, both O₂ and fuel is mixed with the exhaust gas (column 7, lines 45-63) to promote an exothermic reaction in the filter – this is further evidence of incompatibility (because of excess heat) with a system such as Oshima that is concerned with injecting H₂ to promote a NO_x reducing reaction as opposed to an undesired H₂ and O₂ reaction.

Oshima discloses at column 10, lines 24-28 that the NO_x reduction catalyst achieves peak performance at about 150-300 °C when NO_x reduction is effected by H₂. However, Kagenishi discloses at column 7, lines 7-18 that continuous regeneration of the filter is only considered to occur at 300 °C or above. This is in direct conflict with the teaching of Oshima, and shows that the systems of these references are at least partially incompatible and is a further teaching away from combining Kagenishi, Oshima, and Kamihara. Additionally, neither Kamihara nor Kagenishi comprise, or disclose any desire to include a NO_x reducing catalyst. The addition of such a device, as is the focus of Oshima, would be cumbersome and needless and is yet further evidence of teaching away from combining Oshima with Kagenishi and/or Kamihara.

Finally, Kagenishi is cited in the Office Action (at 3) for its alleged teaching of a regeneration regime history and related modification of the regime. Even if this were disclosed in Kagenishi, this would not remedy the deficiencies in Kamihara and Oshima identified in the Office Action (at 2) and above.

Since the Kamihara, Kagenishi, and Oshima references would not reasonably be combined and, even if combined, fail to teach or suggested each feature of the claimed invention, independent claim 1 and each claim depending from claim 1 is patentable over the Kamihara-Kagenishi-Oshima combination. Applicants respectfully request that the rejection of claims 1-6, 9, and 10 be withdrawn and these claims allowed.

Claim 13 defines a method of triggering an exhaust filter regeneration regime and recites “monitoring filter pressure peak values; identifying when a filter load exceeds a predetermined value from the monitored filter pressure peak values and triggering a regeneration regime; initiating fuel injection into an exhaust stream upon triggering the exhaust filter regeneration regime; pre-

heating fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” This method is not taught or suggested by the Kamihara-Kagenishi-Oshima combination.

As discussed above in relation to the patentability of independent claim 1, the Kamihara-Kagenishi-Oshima combination fails to teach or suggest “pre-heating fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream,” as also recited by independent claim 13. For this reason, without more, this claim is patentable over the combination. Furthermore, as extensively discussed above, Oshima would not have been combined with the other references because there is, at best, no motivation to do so, and at worst, teaching away from doing so within the disclosures of the combined references themselves. For these reasons, Applicants respectfully request that the rejection of independent claim 13 be withdrawn and the claim allowed.

Claim 14 defines a method of triggering an exhaust filter regeneration regime in which fuel is injected into an exhaust stream to increase exhaust stream temperature in conjunction with a catalytic treatment element and recites “obtaining a value of catalytic treatment element temperature; triggering the regeneration regime when the obtained temperature exceeds a predetermined value; pre-heating the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” This method is not taught or suggested by the Kamihara-Kagenishi-Oshima combination.

As discussed above in relation to the patentability of independent claim 1, the Kamihara-Kagenishi-Oshima combination fails to teach or suggest “pre-heating the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream,” as also recited by independent claim 14. For this reason, without more, this claim and each claim depending therefrom (claim 15) is patentable over the combination. Furthermore, as discussed above, Oshima would not have been combined with the other references because there is no motivation to do so and

the references teach away from their combination. For these reasons, Applicants respectfully request that the rejection of independent claim 14 be withdrawn and the claim allowed.

Claim 16 defines a method of controlling an exhaust filter regeneration regime and recites “implementing an exhaust stream temperature control strategy; monitoring variation in exhaust stream temperature and at least one control parameter; obtaining a correlation between variation in exhaust stream temperature and the control parameter and adjusting the temperature control strategy based on the collation obtained; pre-heating fuel to be injected into the exhaust stream with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” This method is not taught or suggested by the Kamihara-Kagenishi-Oshima combination.

As discussed above in relation to the patentability of independent claim 1, the Kamihara-Kagenishi-Oshima combination fails to teach or suggest “pre-heating fuel to be injected into the exhaust stream with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream,” as also recited by independent claim 16. For this reason, without more, this claim is patentable over the combination. Furthermore, as discussed above, Oshima would not have been combined with the other references because there is no motivation to do so and the references teach away from their combination. For these reasons, Applicants respectfully request that the rejection of independent claim 16 be withdrawn and the claim allowed.

Claim 17 defines an exhaust filter regeneration apparatus and recites “a fuel injector arranged to be mounted in an exhaust stream conduit; a controller for controlling the fuel injector, said fuel injector and said controller being configured to implement an exhaust filter regeneration regime comprising: injecting fuel into an exhaust stream and thereby increasing an exhaust stream temperature, said increasing exhaust stream temperature being in conjunction with a catalytic treatment element; and metering the fuel injection dependent upon the exhaust stream temperature; wherein the apparatus is further arranged to: pre-heat the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; record a regeneration regime history;

and modify the regeneration regime based on the recorded history..” This apparatus is not taught or suggested by the Kamihara-Kagenishi-Oshima combination.

As discussed above in relation to the patentability of independent claim 1, the Kamihara-Kagenishi-Oshima combination fails to teach or suggest “pre-heat the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream,” as recited by independent claim 17. For this reason, without more, this claim is patentable over the combination. Furthermore, as discussed above, Oshima would not have been combined with the other references because there is no motivation to do so and the references teach away from their combination. For these reasons, Applicants respectfully request that the rejection of independent claim 17 be withdrawn and the claim allowed.

Claim 18 defines an exhaust filter regeneration apparatus and recites “inject fuel in an exhaust stream direction; pre-heat the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; record a regeneration regime history; and modify the regeneration regime based on the recorded history..” This apparatus is not taught or suggested by the Kamihara-Kagenishi-Oshima combination.

As discussed above in relation to the patentability of independent claim 1, the Kamihara-Kagenishi-Oshima combination fails to teach or suggest “pre-heat the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream,” as also recited by independent claim 18. For this reason, without more, this claim and each claim depending therefrom (claims 19-22) is patentable over the combination. Furthermore, as discussed above, Oshima would not have been combined with the other references because there is no motivation to do so and the references teach away from their combination. For these reasons, Applicants respectfully request that the rejection of independent claim 18 be withdrawn and the claim allowed.

Claim 29 defines a computer readable medium storing a set of instructions to operate a computer arranged to implement an exhaust filter regeneration regime and recites “injecting fuel into an exhaust stream and thereby increasing an exhaust stream temperature, said increasing

exhaust stream temperature being in conjunction with a catalytic treatment element; metering the fuel injection dependent upon the exhaust stream temperature; pre-heating the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” This device is not taught or suggested by the Kamihara-Kagenishi-Oshima combination.

As discussed above in relation to the patentability of independent claim 1, the Kamihara-Kagenishi-Oshima combination fails to teach or suggest “pre-heating the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream,” as also recited by independent claim 29. For this reason, without more, this claim and each claim depending therefrom (claim 30) is patentable over the combination. Furthermore, as discussed above, Oshima would not have been combined with the other references because there is no motivation to do so and the references teach away from their combination. For these reasons, Applicants respectfully request that the rejection of independent claims 29 and 30 be withdrawn and the claims allowed.

Claim 31 defines an engine control unit configured to implement an exhaust filter regeneration regime and recites “injecting fuel into an exhaust stream and thereby increasing an exhaust stream temperature, said increasing exhaust stream temperature being in conjunction with a catalytic treatment element; metering the fuel injection dependent upon the exhaust stream temperature; pre-heating the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” This device is not taught or suggested by the Kamihara-Kagenishi-Oshima combination.

As discussed above in relation to the patentability of independent claim 1, the Kamihara-Kagenishi-Oshima combination fails to teach or suggest “pre-heating the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream,” as recited by independent claim 31. For this reason, without more, this claim is patentable over the combination. Furthermore, as discussed above, Oshima would not have been combined with the other references

because there is no motivation to do so and the references teach away from their combination. For these reasons, Applicants respectfully request that the rejection of independent claim 31 be withdrawn and the claim allowed.

Claim 32 defines a computer readable medium storing a set of instructions to operate a computer arranged to implement an exhaust filter regeneration regime and recites “injecting fuel into an exhaust stream and thereby increasing an exhaust stream temperature, said increasing exhaust stream temperature being in conjunction with a catalytic treatment element; metering the fuel injection dependent upon the exhaust stream temperature; pre-heating the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” This device is not taught or suggested by the Kamihara-Kagenishi-Oshima combination.

As discussed above in relation to the patentability of independent claim 1, the Kamihara-Kagenishi-Oshima combination fails to teach or suggest “pre-heating the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream,” as recited by independent claim 32. For this reason, without more, this claim is patentable over the combination. Furthermore, as discussed above, Oshima would not have been combined with the other references because there is no motivation to do so and the references teach away from their combination. For these reasons, Applicants respectfully request that the rejection of independent claim 32 be withdrawn and the claim allowed.

Claim 33 defines a method of controlling exhaust and recites “increasing an exhaust stream temperature; controlling said increasing an exhaust stream temperature in conjunction with a catalytic treatment element; metering fuel injection dependent upon said exhaust stream temperature; pre-heating fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” This method is not taught or suggested by the Kamihara-Kagenishi-Oshima combination.

As discussed above in relation to the patentability of independent claim 1, the Kamihara-Kagenishi-Oshima combination fails to teach or suggest “pre-heating fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream,” as recited by independent claim 33. For this reason, without more, this claim is patentable over the combination. Furthermore, as discussed above, Oshima would not have been combined with the other references because there is no motivation to do so and the references teach away from their combination. For these reasons, Applicants respectfully request that the rejection of independent claim 33 be withdrawn and the claim allowed.

Claim 34 defines an apparatus for controlling exhaust and recites “means for increasing an exhaust stream temperature; means for controlling said increasing an exhaust stream temperature in conjunction with a catalytic treatment element; means for metering fuel injection dependent upon said exhaust stream temperature; means for pre-heating fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; and means for recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” This apparatus is not taught or suggested by the Kamihara-Kagenishi-Oshima combination.

As discussed above in relation to the patentability of independent claim 1, the Kamihara-Kagenishi-Oshima combination fails to teach or suggest “means for pre-heating fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream,” as recited by independent claim 34. The cited combination performs no such function and discloses no structure for performing such a function. For this reason, without more, this claim is patentable over the combination. Furthermore, as discussed above, Oshima would not have been combined with the other references because there is no motivation to do so and the references teach away from their combination. For these reasons, Applicants respectfully request that the rejection of independent claim 34 be withdrawn and the claim allowed.

Claim 4 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kamihara in view of Oshima, Kagenishi, and U.S. Patent 4,535,588 (“Sato”). Applicant respectfully traverses this rejection.

Claim 4 depends from independent claim 1, which has been discussed above as patentable over the Kamihara-Oshima-Kagenishi combination. Claim 4 is patentable thereover for the same reasons. Sato adds nothing to the former art combination so as to render independent claim 1 or dependent claim 4 unpatentable. Specifically, the Kamihara-Oshima-Kagenishi-Sato combination fails to teach or suggest “pre-heating fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream.” For at least this reason, claim 4 is patentable over the cited art. Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of claim 4 be withdrawn and the claim allowed.

Claims 9 and 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kamihara in view of Oshima, Kagenishi, and U.S. Patent 5,884,475 (“Hofmann”). Applicant respectfully traverses this rejection.

Claims 9 and 10 depend from independent claim 1, which has been discussed above as patentable over the Kamihara-Oshima-Kagenishi combination. Claims 9 and 10 are patentable thereover for the same reasons. Hofmann adds nothing to the former art combination so as to render independent claim 1 or dependent claims 9 and 10 unpatentable. Specifically, the Kamihara-Oshima-Kagenishi-Hofmann combination fails to teach or suggest “pre-heating fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream.” For at least this reason, claims 9 and 10 are patentable over the cited art. Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of claims 9 and 10 be withdrawn and the claims allowed.

Claim 11 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 4,492,079 (“Takagi”) in view of Kamihara, Oshima, and Kagenishi. Applicants respectfully traverse this rejection.

Claim 11 defines a method of triggering an exhaust filter regeneration regime and recites “obtaining a value of filter load as function of a filter pressure and an exhaust mass flow and triggering a regeneration regime when the filter load exceeds a predetermined value; initiating fuel injection into an exhaust stream upon triggering the exhaust filter regeneration regime; pre-heating

fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream; and recording a regeneration regime history and modifying the regeneration regime based on the recorded history.” This method is not taught or suggested by the Takagi-Kamihara-Oshima-Kagenishi combination.

As discussed above in relation to claim 1, the combination of Kamihara-Kagenishi-Oshima, without Takagi, fails to teach or suggest “pre-heating fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream,” as recited by independent claim 11. Furthermore, these three references would not have been combined as there would have been no motivation to do so and they teach away from their combination. Takagi cannot remedy the deficiencies of the former combination so as to achieve, teach, or suggest the claimed subject matter or to make the references combinable. In fact, the Office Action (at 6) identifies that Takagi, like the other references, fails to teach the pre-heating feature of the claimed subject matter. Therefore, claim 11 is patentable over the combination. Applicants respectfully request that the rejection of claim 11 be withdrawn and the claim allowed.

Claim 15 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kamihara in view of Oshima, Kagenishi, and Takagi. Applicant respectfully traverses this rejection.

Claim 15 depends from independent claim 14, which has been discussed above as patentable over the Kamihara-Oshima-Kagenishi combination. Claim 15 is patentable thereover for the same reasons. Takagi adds nothing to the former art combination so as to render independent claim 14 or dependent claim 15 unpatentable. Specifically, as discussed in relation to the patentability of independent claim 11, the Kamihara-Oshima-Kagenishi-Takagi combination fails to teach or suggest “pre-heating fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream.” For at least this reason, claim 15 is patentable over the cited art. Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of claim 15 be withdrawn and the claim allowed.

Claims 19, 20, and 22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kamihara in view of Oshima, Kagenishi, and U.S. Patent 6,192,677 (“Tost”). Applicant respectfully traverses this rejection.

Claims 19, 20, and 22 depend from independent claim 18, which has been discussed above as patentable over the Kamihara-Oshima-Kagenishi combination. Claims 19, 20, and 22 are patentable thereover for the same reasons. Tost adds nothing to the former art combination so as to render independent claim 18 or dependent claims 19, 20, and 22 unpatentable. Specifically, the Kamihara-Oshima-Kagenishi-Tost combination fails to teach or suggest any apparatus that can “pre-heat the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream.” For at least this reason, claims 19, 20, and 22 are patentable over the cited are. Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of claims 19, 20, and 22 be withdrawn and the claims allowed.

Claim 21 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kamihara in view of Oshima, Kagenishi, and U.S. Patent 7,140,874 (“Ingalls”). Applicant respectfully traverses this rejection.

Claim 21 depends from independent claim 18, which has been discussed above as patentable over the Kamihara-Oshima-Kagenishi combination. Claim 21 is patentable thereover for the same reasons. Ingalls adds nothing to the former art combination so as to render independent claim 18 or dependent claim 21 unpatentable. Specifically, the Kamihara-Oshima-Kagenishi-Ingalls combination fails to teach or suggest any apparatus that can “pre-heat the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream.” For at least this reason, claim 21 is patentable over the cited are. Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of claim 21 be withdrawn and the claim allowed.

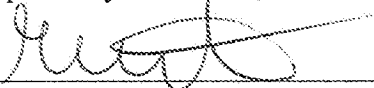
Claims 23, 24, and 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kamihara in view of Oshima, Kagenishi, and U.S. Patent 5,388,406 (“Takeshima”). Applicant respectfully traverses this rejection.

Claims 23, 24, and 26 depend from independent claim 17, which has been discussed above as patentable over the Kamihara-Oshima-Kagenishi combination. Claims 23, 24, and 26 are patentable thereover for the same reasons. Takeshima adds nothing to the former art combination so as to render independent claim 17 or dependent claims 23, 24, and 26 unpatentable. Specifically, the Kamihara-Oshima-Kagenishi-Takeshima combination fails to teach or suggest any apparatus that can "pre-heat the fuel to be injected with vehicle waste heat, wherein the vehicle waste heat is not from the exhaust stream." For at least this reason, claims 23, 24, and 26 are patentable over the cited art. Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of claims 23, 24, and 26 be withdrawn and the claims allowed.

In view of the above, Applicant believes the pending application is in condition for allowance. A notice of allowance for all pending claims is respectfully requested.

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Respectfully submitted,

By 
Gianni Minutoli

Registration No.: 41,198

Ryan H. Flax

Registration No.: 48,141

DICKSTEIN SHAPIRO LLP

1825 Eye Street, NW

Washington, DC 20006-5403

(202) 420-2200

Attorneys for Applicants